2. SPORES AND POLLEN GRAINS FROM EOCENE LAYERS OF MÁLAGA SPAIN

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Abstract

A peculiar assemblage of spores and pollen grains was discovered in the lignite-bearing marl layers of Málaga. The general aspect of the qualitative character of this assemblage is of European type. But based on the quantitative data South American and/or African palaeophytogeographical affinity can be established. The peculiar palm pollen grains of the form-genus *Proxapertites* occur in a very high quantity in some samples, more than 40 per cent. In this paper we present the spores and the pollen grains mostly of European type, the palm, and other monosulcate pollen grains will be the subject of another paper. 3 new taxa are described herein. The spores are represented with 19 form-genera, 2 *gymnosperm* pollen genera were included herein. The representation of the *angiosperm* pollen form-genera is the following: *Longaxones* 7, *Brevaxones, Normapolles* 1, *Postnormapolles* 9.

Key words: Palynology, fossil, Eocene, Málaga, Spain.

Introduction

There are some palynological data of the Upper Cretaceous sediments of Spain. In our point of view the uppermost part is important from the locality of Barranco de la Posa (Lérida), published by DE PORTA, KEDVES, SOLÉ DE PORTA and CIVIS (1985). Paleocene palynomorphs were published from the Pyrenean Region by MÉDUS (1977). Paleocene and Lower Eocene sediments from Southern France and Northern Spain were palynologically investigated by MÉDUS (1975). A Paleogene, probably Eocene spore-pollen assemblage was published by HASELDONCKX (1973) from the Southern Pyrenees, between the Rio Esera and the Rio Segre. Lutetian palynomorphs were described by BUSQUETS, MATIAS and SOLÉ DE PORTA (1986) from the Eastern Pre-Pyrenean Chain. The remarkable presence of the pollen grains of *Pinus, haploxylon* and *diploxylon* type can be emphasized. There are some papers dealing the palynomorphs of the Bartonian sediments of Spain; ALVAREZ, BUSQUETS, SOLÉ DE PORTA and URQUIOLA (1993), BUSQUETS, ALVAREZ, SOLÉ DE PORTA and URQUIOLA, (1994) and CAVAGNETTO and ANADÓN, (1995). The importance of the bisaccate *gymnosperm* pollen grains mostly of *Pinus diploxylon* type must be

emphasized. Worth of mentioning is also the mangrove complex described by CAVAGNETTO and ANADÓN (1995).

During the combined investigations of the Harania cement factory outcrop N. SOLÉ DE PORTA discovered a very peculiar spore-pollen assemblage. Within the *angiosperm* pollen grains there are some pollen grains which were published from the Eocene sediments of Hungary. For example the interesting diporate pollen grains described first from the Eocene layers of Iszkaszentgyörgy. This was the reason for this joint research program. At this moment two papers are planned, the first one is presented herein, the second one will be in Spain, which will present and discuss among others the peculiar palm pollen grains of this locality.

Materials and Methods

Five samples were treated for palynological investigations in Barcelona and in Szeged. The LM investigations were made independently but the results were discussed and evaluated together. All samples were dark bituminous marl sediments. Numbers of the samples are as follows: 92–A–65, 92–A–66–1993, 92–A–66–1994, 92–A–68–1994, 92–A–67.

HCl, NaOH and HF was used for the treatments. The LM pictures were taken in Barcelona and in Szeged. To avoid confusion of the slides and the cross-table numbers, the pictures taken in Barcelona are marked with a "B" at the legend of the plates.

Results

QUALITATIVE DATA
SPORITES

Leiotriletes adriennis (POTONIÉ and GELLETICH 1933) KRUTZSCH 1959, *Schizaeaceae,* cf. *Lygodium* (Plate 2. 1., fig. 1),
Leiotriletes microadriennis KRUTZSCH 1959, *Schizaeaceae,* cf. *Lygodium* (Plate 2.1., figs. 2–4),
Leiotriletes maxoides KRUTZSCH 1962a subfsp. *maxoides, Schizaeaceae,* cf. *Lygodium* (Plate 2.1., fig. 5),
Leiotriletes maxoides KRUTZSCH 1962a subfsp. *maximus* (PFLUG 1953a) KRUTZSCH 1959, *Schizaeaceae,* cf. *Lygodium* (Plate 2.1., fig. 6),
Triplanosporites sinomaxoides KRUTZSCH 1962a, *Schizaeaceae,* cf. *Lygodium* (Plate 2.1., fig. 7),
Stereisporites khargaensis KEDVES 1986, *Sphagnaceae* (Plate 2.1., figs. 8,9),
Stereisporites cf. *divisistereoides* KRUTZSCH 1959, *Sphagnaceae* (Plate 2.1., fig. 10),
Cf. *Obtusisporis* fsp. (Plate 2.1., fig. 11),
Biretisporites elsikii (FREDERIKSEN 1973) KEDVES 1995 (Plate 2.1., figs. 12,13),
Biretisporites fsp. (Plate 2.1., fig. 14),
Monoleiotriletes martinelli n. fsp. (Plate 2.2., figs. 1–3),
Maculatisporites ibericus n. fsp. (Plate 2.2., figs. 4–6),
Maculatisporites eocenicus n. fsp. (Plate 2.3., figs. 1,2),

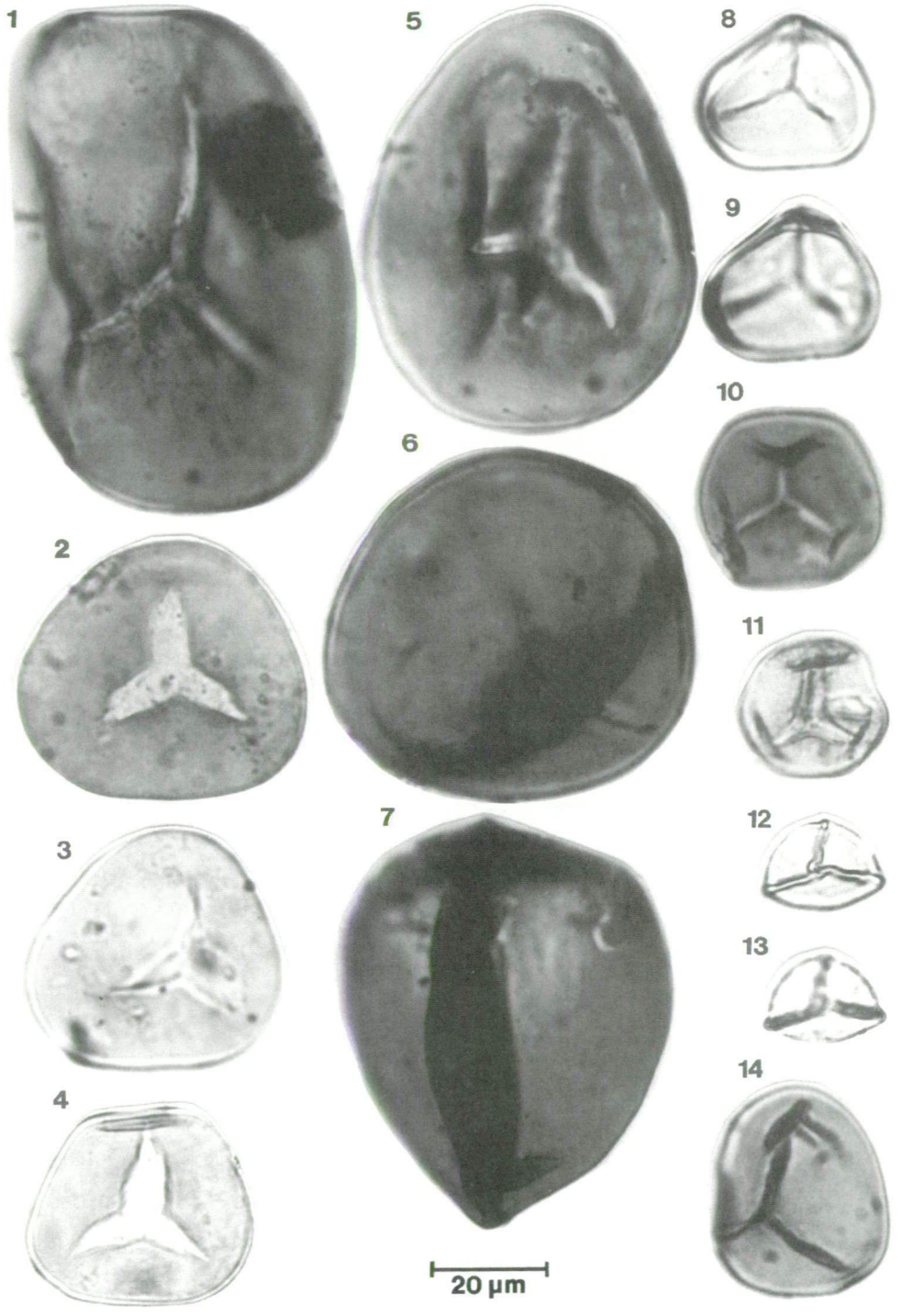
Punctatisporites micropunctus KRUTZSCH 1959 (Plate 2.3., fig. 3),
Punctatisporites luteticus KRUTZSCH 1959 (Plate 2.3., fig. 4),
Punctatisporites gelletichi KEDVES 1961 subfsp. *minor* KEDVES 1961 (Plate 2.3., fig. 5),
Cf. *Punctatisporites* fsp. (Plate 2.3., fig. 6),
Incertae A, *Monoleiotriletes* fsp., or n. fgen. (Plate 2.3., fig. 7),
Incertae B, cf. *Leiotriletes* fsp. (Plate 2.3., fig. 8),
Triremisporites delcourti DÖRING 1965, *Gleicheniaceae* (Plate 2.3., figs.9,10, plate 2.4., fig. 1),
Gleicheniidites circinidites (COOKSON 1953) BRENNER 1963, *Gleicheniaceae* (Plate 2.4., figs.2,3),
Echinatisporis fsp., *Selaginellaceae, Selaginella* (Plate 2.4., fig. 4),
Foveotriletes fsp. (Plate 2.4., fig. 5),
Cicatricosisporites cf. *triangulus* KEDVES 1973, *Schizaeaceae, ?Anemia* (Plate 2.4., fig. 6),
Cf. *Gabonisporis* fsp. (Plate 2.4., fig. 7),
Polypodiaceoisporites brevisculptatus KEDVES 1973, *Pteridaceae* (Plate 2.4., figs. 8–11),
Polypodiaceoisporites minor KEDVES 1961, *Pteridaceae* (Plate 2.4., fig. 12),
Polypodiaceoisporites bauxitus KEDVES and J. RÁKOSY 1965, *Pteridaceae* (Plate 2.4., figs. 13,14),
Polypodiaceoisporites fsp. A, *Pteridaceae* (Plate 2.4., fig. 15),
Polypodiaceoisporites fsp. B, *Pteridaceae* (Plate 2.4., fig. 16),
Cf. *Polypodiaceoisporites* fsp., *Pteridaceae* (Plate 2.4., fig. 17),
Undulozonosporites microundulus KEDVES 1974, *Pteridaceae* (Plate 2.4., figs. 18,19),
Verrucingulatisporites fsp., *Pteridaceae* (Plate 2.4., fig. 20),
Verrucatosporites saalensis KRUTZSCH 1959, *Polypodiaceae,* (Plate 2.4., fig. 21),
Reticulosporis cf. *gracilis* KRUTZSCH 1967 (Plate 2.4., fig. 22),

POLLENITES
SACCITES
DISACCITES

Cf. *Podocarpidites* fsp., *Podocarpaceae* (Plate 2.4., fig. 23),
Pityosporites labdacus (POTONIÉ 1931) THOMSON and PFLUG 1953 subfsp. *labdacus, Abietaceae, Pinus* (Plate 2.5., fig. 1),

LONGAXONES

Cupuliferoipollenites quisqualis (POTONIÉ 1934) POTONIÉ 1960, *Fagaceae* v. *Leguminosae* (Plate 2.5., fig. 2),
Cupuliferoipollenites cf. *liblarensis* (THOMSON in POTONIÉ, THOMSON and THIERGART 1950) POTONIÉ 1960, *Fagaceae* v. *Leguminosae* (Plate 2.5., fig. 3),
Polycolpites fsp. (Plate 2.5., fig. 4),
Intragranulitricolporites tumescens (KEDVES 1964) KEDVES 1978, *Calyceraceae* (Plate 2.5., figs. 5,6),
Intrabaculitricolporites porasper (PFLUG 1953a) KEDVES 1978 (Plate 2.5., fig. 7),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Retitricolporites macrodurensis (PFLUG and THOMSON 1953) ROCHE and SCHULER 1976, *Vitaceae, Cissus* (Plate 2.5., figs. 8,9),
Ilexpollenites margaritatus (POTONIÉ 1931) THIERGART 1937 f. *medius* PFLUG and THOMSON 1953, *Aquifoliaceae, Ilex* (Plate 2.5., fig. 10),
Tetracolporopollenites megadolium (POTONIÉ 1934) OLLIVIER-PIERRE 1980, *Sapotaceae* (Plate 2.5., fig.11),
Tetracolporopollenites hungaricus KEDVES 1965, *Sapotaceae* (Plate 2.5., figs. 12,13),
Tetracolporopollenites sapotoides PFLUG and THOMSON 1953, *Sapotaceae* (Plate 2.5., fig. 14),
Tetracolporopollenites obscurus PFLUG and THOMSON 1953, *Sapotaceae* (Plate 2.5., fig. 15),
Pentapollenites laevigatus KRUTZSCH 1962b subfsp. *laevigatus, Elaeagnaceae* v. *Simarubaceae* (Plate 2.5., figs. 16,17),
Pentapollenites laevigatus KRUTZSCH 1962b subfsp. *luteticus* GRUAS-CAVAGNETTO 1969, *Elaeagnaceae* v. *Simarubaceae* (Plate 2.5., figs. 18,19).

BREVAXONES
NORMAPOLLES

Plicapollis pseudoexcelsus (KRUTZSCH 1958) KRUTZSCH 1961 subfsp. *turgidus* PFLUG 1953a, cf. *Myricaceae* (Plate 2.5., figs. 24–31),
Plicapollis pseudoexcelsus (KRUTZSCH 1958) KRUTZSCH 1961 subfsp. *minor* PFLUG 1953a, cf. *Myricaceae* (Plate 2.5., figs. 32,33),

Plate 2.1.

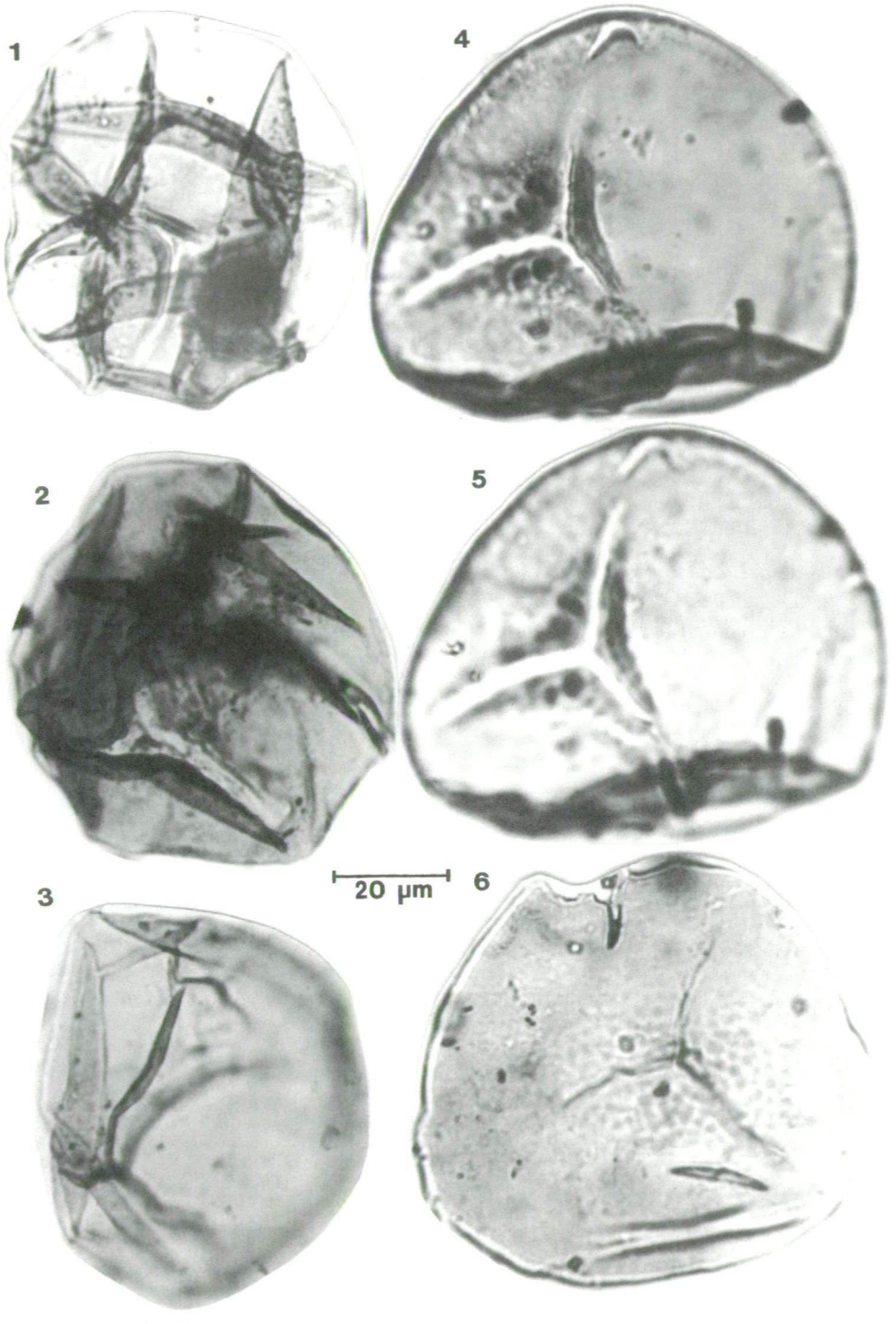
1. *Leiotriletes adriennis* (POTONIÉ and GELLETICH 1933) KRUTZSCH 1959, *Schizaeaceae,* cf. *Lygodium,* slide: B 92A–66–1; cross-table number: 50.1/103.2.
2. *Leiotriletes microadriennis* KRUTZSCH 1959, *Schizaeaceae*, cf. *Lygodium,* slide: B 92A-66-13; cross-table number: 40.8/106.7.
3. *Leiotriletes microadriennis* KRUTZSCH 1959, *Schizaeceae,* cf. *Lygodium,* slide: 92A-66-92-1; cross-table number: 10.5/139.2.
4. *Leiotriletes microadriennis* KRUTZSCH 1959, *Schizaeaceae,* cf. *Lygodium,* slide: 92A-66-93-4; cross-table number: 22.9/148.8.
5. *Leiotriletes maxoides* KRUTZSCH 1962a subfsp. *maxoides, Schizaeaceae,* cf. *Lygodium,* slide: B 92A-66-1; cross-table number: 30.0/108.0.
6. *Leiotriletes maxoides* KRUTZSCH 1962a subfsp. *maximus* (PFLUG 1953a) KRUTZSCH 1959, *Schizaeaceae,* cf. *Lygodium,* slide: B 92A-66-18; cross-table number: 43.4/107.7.
7. *Triplanosporites sinomaxoides* KRUTZSCH 1962a, *Schizaeaceae,* cf. *Lygodium,* slide: B 92A-66-2; cross-table number: 27.3/94.4.

8,9. *Stereisporites khargaensis* KEDVES 1986, *Sphagnaceae,* slide: 92A-66-93-1; cross-table number: 8.3/137.8.

10. *Stereisporites* cf. *divisistereoides* KRUTZSCH 1959, *Sphagnaceae,* slide: B 92A-66-6; cross-table number: 31.7/108.0.
11. Cf. *Obtusisporis* fsp., slide: B 92A-66-4; cross-table number:43.5/106.5.

12,13. *Biretisporites elsikii* (FREDERIKSEN 1973) KEDVES 1995, slide: 92A-68-2; cross-table number: 9.9/131.7.

14. *Biretisporites* fsp., slide: B 92A-66-15; cross-table number: 41.0/106.8.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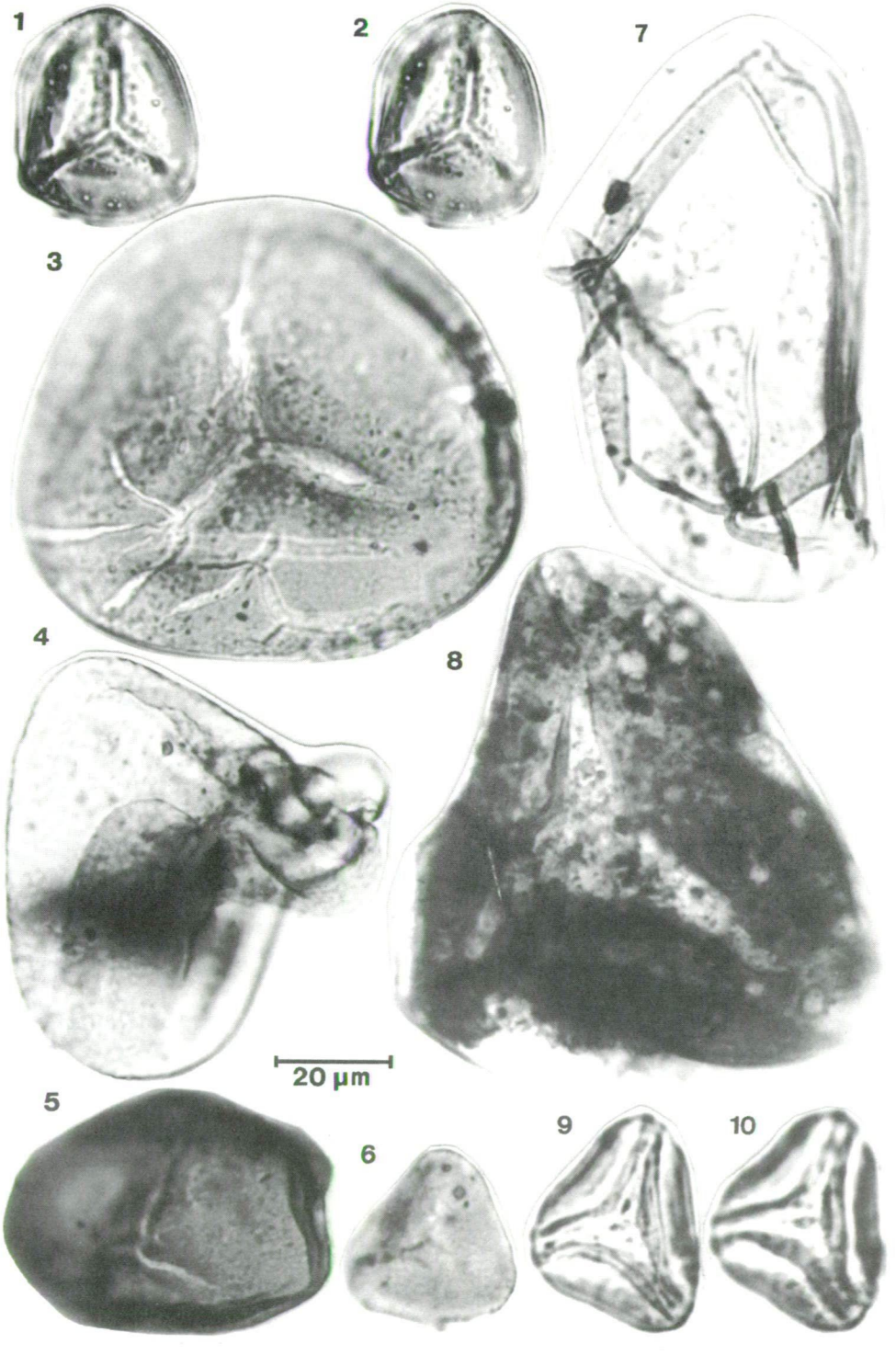
Plicapollis pseudoexcelsus (KRUTZSCH 1958) KRUTZSCH 1961 subfsp. *luteticus* KEDVES 1969, cf. *Myricaceae* (Plate 2.5., fig. 34).

POSTNORMAPOLLES

Bombacacidites fsp. A, *Bombacaceae* (Plate 2.5., figs. 20,21),
Bombacacidites fsp. B, *Bombacaceae* cf. *Ceiba* (Plate 2.5., fig. 22),
Intratriporopollenites microreticulatus MAI 1961 subfsp. *minimus* MAI 1961, *Tiliaceae* (Plate 2.5., fig. 23),
Plicatopollis cf. *plicatus* (POTONIÉ 1934) KRUTZSCH 1962c, *Juglandaceae* (Plate 2.5., figs. 35,36),
Platycaryapollenites shandongensis KE and SHI 1978, *Juglandaceae, Platycarya* (Plate 2.6., figs. 1,2),
Platycaryapollenites miocaenicus E. NAGY 1969, *Juglandaceae, Platycarya* (Plate 2.6., figs. 3,4),
Platycaryapollenites ferreri DE PORTA, KEDVES, SOLÉ DE PORTA and CIVIS 1985, *Juglandaceae, Platycarya* (Plate 2.6., figs. 5–10),
Labraferoidaepollenites intermedius (GLADKOVA 1965) *Myricaceae* (Plate 2.6., figs. 11,12),
Compositoipollenites rizophorus (POTONIÉ 1934) POTONIÉ 1960 subfsp. cf. *burghasungensis* MÜRRIGER and PFLUG 1953, *Icacinaceae* (Plate 2.6., figs. 13,14),
Compositoipollenites rizophorus (POTONIÉ 1934) POTONIÉ 1960 subfsp. cf. *burghasungensis* MÜRRIGER and PFLUG 1953, *Icacinaceae* (Plate 2.6., fig. 15),
Restioniidites minimus (KRUTZSCH 1970) KEDVES 1974, *Restionaceae* (Plate 2.6., figs. 16,17),
Triporopollenites constans TAKAHASHI 1961, *Corylaceae* (Plate 2.6., fig. 18),
Triporopollenites robustus PFLUG 1953a subfsp. *minor* KEDVES 1970, cf. *Betulaceae* (Plate 2.6., figs. 19–24),
Subtriporopollenites sympathicus (BOTSCHARNIKOVA 1960) KEDVES 1970, *Juglandaceae* (Plate 2.6., fig. 25),
Subtriporopollenites constans PFLUG 1953a subfsp. *constans, Juglandaceae* (Plate 2.6., figs. 26–32),
Subtriporopollenites constans PFLUG 1953a subfsp. *crassiexinus* KEDVES 1970 (Plate 2.6., figs. 33,34),
Subtriporopollenites subporatus KRUTZSCH 1961 subfsp. *subporatus, Juglandaceae* (Plate 2.6., figs. 35–38),

Plate 2.2.

1. *Monoleiotriletes martinelli* n. fsp., slide: B 92A-66-3; cross-table number: 48.1/112.0.
2. *Monoleiotriletes martinelli* n. fsp., slide: B 92A-66-16; cross-table number: 33.8/96.1.
3. *Monoleiotriletes martinelli* n. fsp., slide: B 92A-66-19; cross-table number: 33.7/92.7.
4,5. *Maculatisporites ibericus* n. fsp., slide: 92A-66-93-1; cross-table number: 17.8/149.2.
6. *Maculatisporites ibericus* n. fsp., slide: 92A-66-93-1; cross-table number: 9.6/139.6.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Subtriporopollenites facilis (BOTSCHARNIKOVA 1960) KEDVES 1970, *Juglandales* (Plate 2.6., figs. 39,40).

THE NEW TAXA DESCRIBED FROM THIS MATERIAL

Form-genus: *Monoleiotriletes* KRUTZSCH 1959

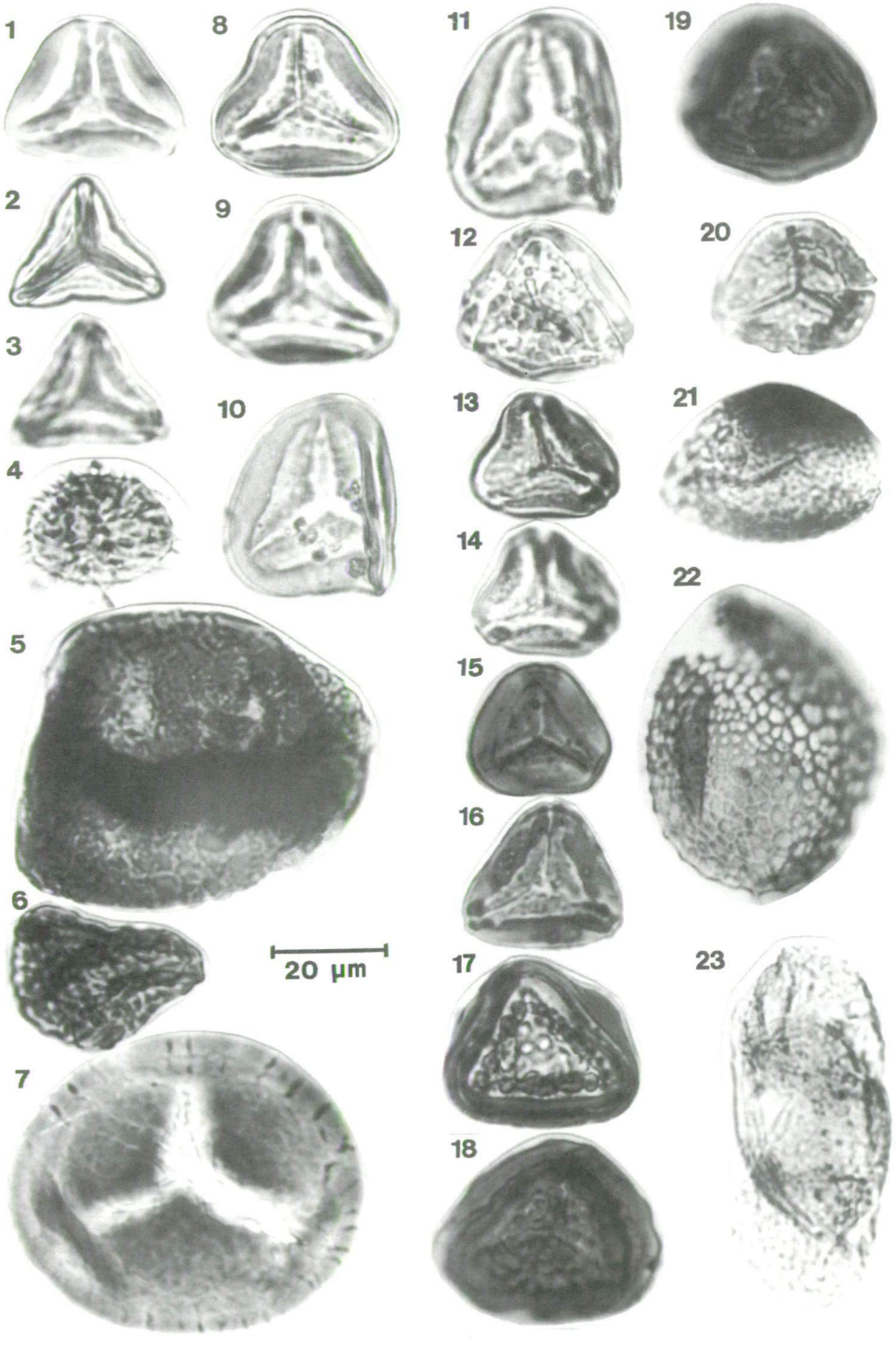
Monoleiotriletes martinelli n. fsp.
(Plate 2.2., figs. 1–3)

Diagnosis

Amb originally circular but secondarily altered with several foldings. Exospore is one layered with the LM method. The thickness of the wall is about 1–1.5 μm. Surface smooth or finely scabrate/punctate. The laesurae of the tetrad scar do not reach the equatorial contour, r = 3/4 – 4/5 approximately. Near the tetrad scar there is a torus-like thickening of 2–3.5 μm. This morphological characteristic feature may be secondary. The laesurae are often folded in the proximal pole there is a small thickening of Y shape.
Diameter: 65.0-80.0 μm.
Holotype: Plate 2.2., fig. 1, slide: B 92A-66–3; cross-table number: 48.1/112.0.
Locus typicus: Málaga.
Stratum typicum: carbonaceous marl.
Derivatio nominis: In honour of Prof. Dr. J. MARTINELL for his kind assistance in the palynological cooperations.
Differential diagnosis: Our new form-species differs from *M. angustus* KRUTZSCH 1959, by its thicker wall, with the longer laesurae and the complicated tetrad scar. The size of *Monoleiotriletes gracilis* KRUTZSCH, 1959 is below 50 μm, the *M. minimus* KRUTZSCH is smaller, about 33 μm in diameter, and the laesurae of the tetrad scar can reach the equatorial contour. *M. delmeri* ROCHE 1973 is also smaller (40–45 μm) and its laesurae are shorter (1/4–1/2) than those of the new form-species described.
Remark. – ROCHE and SCHULER (1976) published three form-species (*M. gracilis, M. angustus* and *M. minimus*) from Oligocene layers of Belgium. ROCHE (1973) described his new form-species from the Landénian from Belgium. FREDERIKSEN (1980)

Plate 2.3.

1,2. *Maculatisporites eocenicus* n. fsp., slide: 92A-66-93-1; cross-table number: 9.6/139.6.
3. *Punctatisporites micropunctus* KRUTZSCH 1959, slide: B 92A-66-5; cross-table number:42.0/103.8.
4. *Punctatisporites luteticus* KRUTZSCH 1959, slide: B 92A-67-3; cross-table number: 34.4/94.8.
5. *Punctatisporites gelletichi* KEDVES 1961 subfsp. *minor* KEDVES 1961, slide: B 92A-67-1; cross-table number: 23.8/109.4.
6. Cf. *Punctatisporites* fsp., slide: B 92A-66-20; cross-table number: 38.7/104.3.
7. Incertae A, *Monoleiotriletes* fsp. or n. fgen., slide: B 92A-66; cross-table number: 23.2/103.2.
8. Incertae B, cf. *Leiotriletes* fsp., slide: B 92A-66-8; cross-table number: 24.0/93.4.
9,10. *Triremisporites delcourti* DÖRING 1965, *Gleicheniaceae,* slide: 92A-66-93-1; cross-table number: 10.9/143.6.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published a spore (*Monoleiotriletes* sp., Plate 2, fig. 8) from the Jackson Group (Upper Eocene) of Mississippi and Western Alabama. KRUTZSCH (1959) described its species from the Lutetian layers. *M. gracilis* and *M. minimus* KRUTZSCH 1962a were published from the Paleogene layers of the Massif Armoricain (France) by OLLIVIER-PIERRE (1980).

Form-genus: *Maculatisporites* DÖRING 1964

1. *Maculatisporites ibericus* n. fsp.
(Plate 2.2., figs. 4–6)

Diagnosis

Amb triangular with convex sides. The laesurae of the tetrad scar do not reach the equator, r = 1/2–2/3. Sculpture maculate to finely granulate except the proximal pole. Around the laesurae there are larger sculptural elements, flat verrucae. The diameter of the ornamental elements is 1.5–3.5 μm. The wall of the spore is relatively thin; 1.5-2.5 μm.
Diameter: 60–80 μm.

Plate 2.4.

1. *Triremisporites delcourti* DÖRING 1965, *Gleicheniaceae,* slide: B 92A-66-8; cross-table number: 34.3/105.2.
2,3. *Gleicheniidites circinidites* (COOKSON 1953) BRENNER 1963, *Gleicheniaceae,* slide: 92A-66-94-2; cross-table number: 10.4/120.1.
4. *Echinatisporis* fsp., *Selaginellaceae, Selaginella,* slide: B 92A-68-10; cross-table number: 30.0/105.9.
5. *Foveotriletes* fsp., slide: B 92A-66-7; cross-table number: 36.3/101.4.
6. *Cicatricosisporites* cf. *triangulus* KEDVES 1973, *Schizaeaceae, ?Anemia,* slide: B 92A-66-19;cross-table number: 38.8/101.7.
7. Cf. *Gabonisporis* fsp., without perispore, slide: B 92A-66-9; cross-table number: 49.6/107.7.
8,9. *Polypodiaceoisporites brevisculptatus* KEDVES 1973, *Pteridaceae,* slide: 92A-66-93-4; cross-table number: 12.6/118.2.
10,11. *Polypodiaceoisporites brevisculptatus* KEDVES 1973, *Pteridaceae,* slide: 92A-66-93-1; cross-table number: 20.3/132.4.
12. *Polypodiaceoisporites minor* KEDVES 1961, *Pteridaceae,* slide: B 92A-67-1; cross-table number: 23.0/96.9.
13,14. *Polypodiaceoisporites bauxitus* KEDVES and J. RÁKOSY 1965,*Pteridaceae,* slide: 92A-66-93-1; cross-table number: 14.3/127.7.
15. *Polypodiaceoisporites* fsp. A, *Pteridaceae,* slide: B 92A-66-3; cross-table number: 24.0/93.3.
16. *Polypodiaceoisporites* fsp. B, *Pteridaceae,* slide: B 92A-66-7; cross-table number: 39.0/100.8.
17. Cf. *Polypodiaceoisporites* fsp., *Pteridaceae,* slide: B 92A-66-3; cross-table number: 31.3/111.5.
18. *Undulozonosporites microundulus* KEDVES 1974, *Pteridaceae,* slide: B 92A-66-10; cross-table number: 42.2/101.
19. *Undulozonosporites microundulus* KEDVES 1974, *Pteridaceae,* slide: B 92A-66-7; cross-table number: 25.5/102.2.
20. *Verrucingulatisporites* fsp., *Pteridaceae,* slide: B 92A-66-8; cross-table number: 36.5/105.3.
21. *Verrucatosporites saalensis* KRUTZSCH 1959, *Polypodiaceae,* slide: B 92A-66-9; cross-table number: 31.4/99.5.
22. *Reticulosporis* cf. *gracilis* KRUTZSCH 1967, slide: B 92A-66-16; cross-table number: 48.0/113.4.
23. Cf. *Podocarpidites* fsp., *Podocarpaceae,* slide: B 92A-68-12; cross-table number: 39.0/108.7.

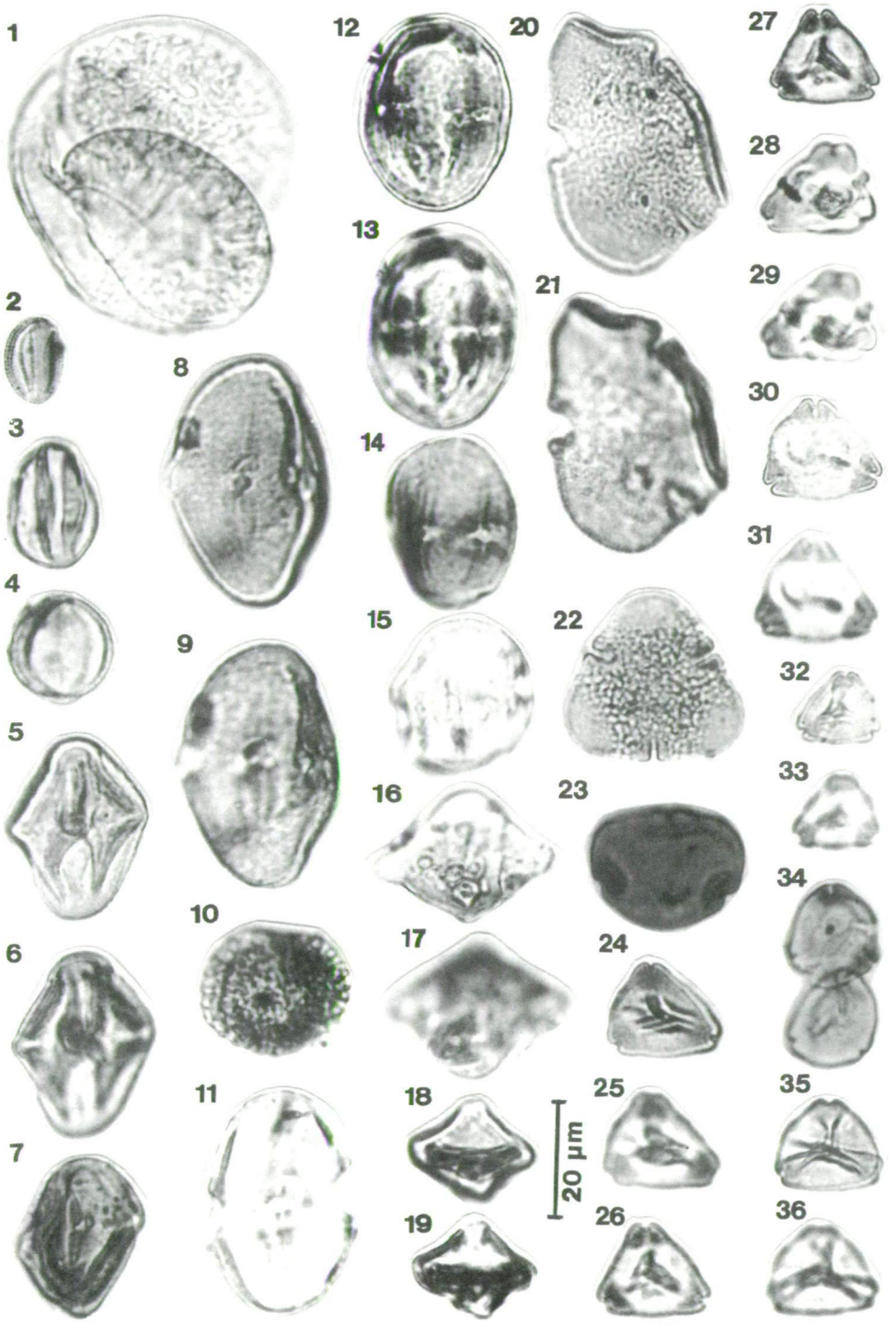
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Plate 2.5.

1. *Pityosporites labdacus* (POTONIÉ 1931) THOMSON and PFLUG 1953 subfsp. *labdacus*, *Abietaceae*, *Pinus*, slide: B 92A-68-4; cross-table number: 41.0/104.2.
2. *Cupuliferoidaepollenites quisqualis* (POTONIÉ 1934) POTONIÉ 1960, *Fagaceae* v. *Leguminosae,* slide: B 92A-67-45; cross-table number: 51.5/95.5.
3. *Cupuliferoipollenites* cf. *liblarensis* (THOMSON in POTONIÉ, THOMSON and THIERGART 1950) POTONIÉ 1960, *Fagaceae* v. *Leguminosae,* slide: B 92A-66-9; cross-table number: 31.2/96.7.
4. *Polycolpites* fsp., slide: B 92A-65; cross-table number: 30.0/94.7.

5,6. *Intragranulitricolporites tumescens* (KEDVES 1964) KEDVES 1978, *Calyceraceae,* slide: 92A-65-2; cross-table number: 16.2/123.9.

7. *Intrabaculitricolporites porasper* (PFLUG 1953a) KEDVES 1978, slide: B 92A-66-4; cross-table number: 51.2/96.9.

8,9. *Retitricolporites macrodurensis* (PFLUG and THOMSON 1953) ROCHE and SCHULER 1976, *Vitaceae, Cissus,* slide: 92A-66-93-1; cross-table number:18.4/149.3.

10. *Ilexpollenites margaritatus* (POTONIÉ 1931) THIERGART 1937 f. *medius* PFLUG and THOMSON 1953, *Aquifoliaceae, Ilex,* slide: B 92A-66-7; cross-table number: 30.0/98.4.

11. *Tetracolporopollenites megadolium* (POTONIÉ 1934) OLLIVIER-PIERRE 1980, *Sapotaceae,* slide: B 92A-67-5; cross-table number: 47.1/93.4.

12,13. *Tetracolporopollenites hungaricus* KEDVES 1965, *Sapotaceae,* slide: 92A-66-93-4; cross-table number: 17.9/139.1.

14. *Tetracolporopollenites sapotoides* PFLUG and THOMSON 1953, *Sapotaceae,* slide: B 92A-68-4; cross-table number: 31.1/94.8.

15. *Tetracolporopollenites obcurus* PFLUG and THOMSON 1953, *Sapotaceae*, slide: B 92A-68-13; cross-table number: 26.4/92.4.

16,17. *Pentapollenites laevigatus* KRUTZSCH 1962 subfsp. *laevigatus, Elaeagnaceae* v. *Simarubaceae*, slide: 92A-65-3; cross-table number: 16.2/138.3.

18,19. *Pentapollenites laevigatus* KRUTZSCH 1962 subfsp. *luteticus* GRUAS-CAVAGNETTO 1969, *Elaeagnaceae* v. *Simarubaceae*, slide: 92A-68-3; cross-table number: 15.2/137.2.

20,21. *Bombacacidites* fsp. A, *Bombacaceae*, slide: 92A-66-93-2; cross-table number: 22.2/123.8.

22. *Bombacacidites* fsp. B, *Bombacaceae*, cf. *Ceiba*, slide: B 92A-68-2; cross-table number: 45.5/92.9.

23. *Intratriporopollenites microreticulatus* MAI 1961 subfsp. *minimus* MAI 1961, *Tiliaceae*, slide: 92A-66-7; cross-table number: 26.8/105.5.

24,25. *Plicapollis pseudoexcelsus* (KRUTZSCH 1958) KRUTZSCH 1961 subfsp. *turgidus* PFLUG 1953a, cf. *Myricaceae*, slide: 92A-66-94-3; cross-table number: 12.2/120.3.

26,27. *Plicapollis pseudoexcelsus* (KRUTZSCH 1958) KRUTZSCH 1961 subfsp. *turgidus* PFLUG 1953a, cf. *Myricaceae,* slide: 92A-66-93-4; cross-table number: 12.7/133.2.

28,29. *Plicapollis pseudoexcelsus* (KRUTZSCH 1958) KRUTZSCH 1961 subfsp. *turgidus* PFLUG 1953a, cf. *Myricaceae*, slide: 92A-67-1; cross-table number: 20.3/146.2.

30,31. *Plicapollis pseudoexcelsus* (KRUTZSCH 1958) KRUTZSCH 1961 subfsp. *turgidus* PFLUG 1953a, cf. *Myricaceae*, slide: 92A-66-93-1; cross-table number: 7.7/146.3.

32,33. *Plicapollis pseudexcelsus* (KRUTZSCH 1958) KRUTZSCH 1961 subfsp. *minor* PFLUG 1953a, cf. *Myricaceae*, slide: 92A-66-93-1; cross-table number: 7.4/125.3.

34. *Plicapollis pseudoexcelsus* (KRUTZSCH 1958) KRUTZSCH 1961 subfsp. *luteticus* KEDVES 1969, cf. *Myricaceae*, slide: B 92A-66-9; cross-table number: 47.2/98.7.

35,36. *Plicatopollis* cf. *plicatus* (POTONIÉ 1934) KRUTZSCH 1962c, *Juglandaceae*, slide: 92A-66-93-3; cross-table number: 21.8/111.6.

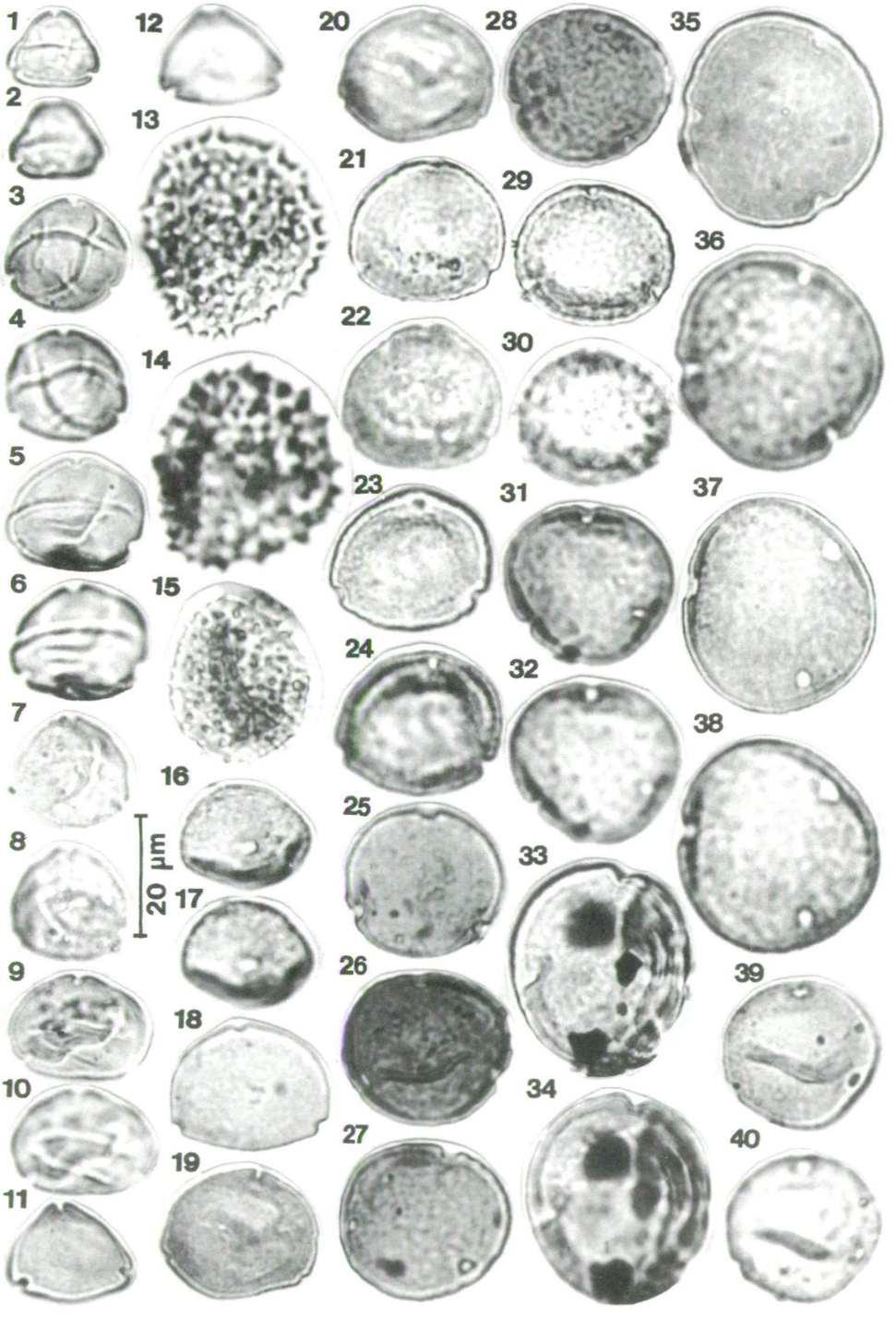
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Plate 2.6.

1,2. *Platycaryapollenites shandongensis* KE and SHI 1978, *Juglandaceae, Platycarya*, slide: 92A-68-4; cross-table number: 12.7/146.4.

3,4. *Platycaryapollenites miocaenicus* E. NAGY 1969, *Juglandaceae, Platycarya*, slide: 92A-66-93-3; cross-table number: 9.3/144.2.

5,6. *Platycaryapollenites ferreri* DE PORTA, KEDVES, SOLÉ DE PORTA and CIVIS 1985, *Juglandaceae, Platycarya*, slide: 92A-66-93-1; cross-table number: 8.1/134.2.

7,8. *Platycaryapollenites ferreri* DE PORTA, KEDVES, SOLÉ DE PORTA and CIVIS 1985, *Juglandaceae, Platycarya*, slide: 92A-65-1; cross-table number:18.2/149.8.

9,10. *Platycaryapollenites ferreri* DE PORTA, KEDVES, SOLÉ DE PORTA and CIVIS 1985, *Juglandaceae, Platycarya*, slide: 92A-67-1; cross-table number: 19.7/137.3.

11,12. *Labraferoidaepollenites intermedius* (GLADKOVA 1965) *Myricaceae*, slide: 92A-66-93-1; cross-table number: 7.9/142.5.

13,14. *Compositoipollenites rizophorus* (POTONIÉ 1934) POTONIÉ 1960 subfsp. *burghasungensis* MÜRRIGER and PFLUG 1953, *Icacinaceae*, slide: 92A-66-93-1; cross-table number: 13.3/149.2.

15. *Compositoipollenites rizophorus* (POTONIÉ 1934) POTONIÉ 1960 subfsp. cf. *burghasungensis* MÜRRIGER and PFLUG 1953, *Icacinaceae*, slide: B 92A-67-3; cross-table number:12.4/131.7.

16,17. *Restioniidites minimus* (KRUTZSCH 1970) KEDVES 1974, *Restionaceae*, slide: 92A-67-3; cross-table number:12.4/131.7.

18. *Triporopollenites constans* TAKAHASHI 1961, *Corylaceae*, slide: B 92A-66-2; cross-table number: 44.7/106.7.

19,20. *Triporopollenites robustus* PFLUG 1953a subfsp. *minor* KEDVES 1970, cf. *Betulaceae*, slide: 92A-67-4; cross-table number: 23.5/146.3.

21,22. *Triporopollenites robustus* PFLUG 1953a subfsp. *minor* KEDVES 1970, cf. *Betulaceae*, slide: 92A-65-2; cross-table number: 16.2/123.9.

23,24. *Triporopollenites robustus* PFLUG 1953a subfsp. *minor* KEDVES 1970, cf. *Betulaceae*, slide: 92A-66-93-1; cross-table number: 9.9/121.0.

25. *Subtriporopollenites sympathicus* (BOTSCHARNIKOVA 1960) KEDVES 1970, *Juglandaceae,* slide: B 92A-66-2; cross-table number: 23.9/95.5.

26. *Subtriporopollenites constans* PFLUG 1953a subfsp. *constans, Juglandaceae,* slide: B 92A-66-15; cross-table number: 37.8/99.1.

27. *Subtriporopollenites constans* PFLUG 1953a subfsp. *constans, Juglandaceae,* slide: B 92A-66-8; cross-table number: 26.0/103.1.

28. *Subtriporopollenites constans* PFLUG 1953a subfsp. *constans, Juglandaceae,* slide: B 92A-66-5; cross-table number: 25.3/106.7.

29,30. *Subtriporopollenites constans* PFLUG 1953a subfsp. *constans, Juglandaceae,* slide: B 92A-66-93-4; cross-table number: 15.2/136.2.

31,32. *Subtriporopollenites constans* PFLUG 1953a subfsp. *constans, Juglandaceae,* slide: B 92A-66-93-1; cross-table number: 10.9/138.9.

33,34. *Subtriporopollenites constans* PFLUG 1953a subfsp. *crassiexinus* KEDVES 1970, *?Juglandaceae,* slide: 92A-66-93-1; cross-table number: 24.3/115.9.

35,36. *Subtriporopollenites subporatus* KRUTZSCH 1961 subfsp. *subporatus, Juglandaceae,* slide: 92A-66-2; cross-table number: 7.7/138.2.

37,38. *Subtriporopollenites subporatus* KRUTZSCH 1961 subfsp. *subporatus, Juglandales,* slide: 92A-66-93-4; cross-table number: 6.8/120.2.

39,40. *Subtriporopollenites facilis* (BOTSCHARNIKOVA 1960) KEDVES 1970, *Juglandales,* slide: 92A-65-3; cross-table number: 18.9/149.4.

Holotype: Plate 2.2., figs. 4,5, slide: 92A–66–93–1; cross-table number: 17.8/149.2.
Locus typicus: Málaga.
Stratum typicum: carbonaceous marl.
Derivatio nominis: From Iberia.
Differential diagnosis: The characteristic polar ornamentation and the convex contour well separate from *M. maculatus* DÖRING 1964. The wall of *M. rotangulus* is much more thicker than those of our new form-species.

2. *Maculatisporites eocenicus* n. fsp.
(Plate 2.3., figs. 1,2)

Diagnosis

Amb triangular with convex sides. The laesurae are long but do not always reach the equator, r = 4/5–5/5. Around the laesurae of the tetrad scar there are thickenings of about 1.5 μm. The ornamentation of the surface is finely maculate, except the polar area. The bordering area of the narrow kyrtom is surrounded by flat verrucae-like, large granules of 0.8–1.2 μm diameter. The thickness of the wall is 1.2–1.8 μm.
Diameter: 28.0–35.0 μm.
Holotype: Plate 2.3., figs. 1,2; slide: 92A–66–93–1; cross-table number: 9.6/139.6.
Locus typicus: Málaga.
Stratum typicum: carbonaceous marl.
Derivatio nominis: From the age of the stratum typicum.
Differential diagnosis: The smaller size distinct well this new form-species from the previously described within this form-genus.

Discussion and Conclusions

As it was emphasized in the abstract and in the introduction, this paper presents one part of our results. Namely: the spores and the pollen grains, which are characteristic mostly for the European, sensu lato for the Paleogene layers of the Northern Hemisphere. Taking into consideration the bibliographical data of the Upper Cretaceous and the Paleogene sporomorphs, from the point of view of Paleophytogeography and Palynostratigraphy, the following groups can be recognized:

1. Sporomorphs, which are characteristic for the Lutetian are the following:
Leiotriletes adriennis
Punctatisporites luteticus
Polypodiaceoisporites brevisculptatus
Polypodiaceoisporites minor
Undulozonosporites microundulus
Pentapollenites laevigatus subfspp.

2. *Angiosperm* pollen grains which occur mostly in the lower part of the Middle Eocene:
Plicapollis pseudoexcelsus turgidus
Plicapollis pseudoexcelsus minor

Labraferoidaepollenites intermedius
Triporopollenites robustus minor
Subtriporopollenites sympathicus
Subtriporopollenites constans constans
Subtriporopollenites subporatus subporatus
Subtriporopollenites facilis
3. As older forms
Stereisporites khargaensis
Triremisporites delcourti and the
Platycaryapollenites ferreri can be pointed out.

4. Older, Mesozoic relict or reworked spores are the representatives of the form-genus *Maculatisporites.*

5. As younger mostly Upper Eocene and Oligocene *angiosperm* types the *Bombacaceae* pollen grains may be mentioned.

6. Paleophytogeographically the presence of the form-genera *Platycaryapollenites* and *Plicatopollis* is interesting. In the Paris Basin during the Paleogene the fossil forms of the genus *Platycarya* are important. In the Carpath Basin there are few specimens of *Platycaryapollenites* during the Paleogene, but the *Plicatopollis,* as an extinct group of the *Juglandaceae* is extremely abundant in several localities.

In resumé for the geological age on the basis of the presented data, the Middle Eocene can be established, in all probability, the lower part of the Middle Eocene.

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